DOCUMENT RESUME

ED 242 065 EA 016 587

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TITLE Small-Group Cooperative Learning in the Classroom.
INSTITUTION Oregon School Study Council, Eugene.
PUB DATE Mar 84
NOTE 36p.
AVAILABLE FROM Publications, Oregon School Study Council, 1787 Agate Street, University of Oregon, Eugene, OR 97403 ($4.00; quantity discounts).
PUB TYPE Collected Works - Serials (022) -- Reports - Research/Technical (143)
JOURNAL CIT OSSC Bulletin; v27 n7 Mar 1984

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Achievement; Change Strategies; Classroom Environment; *Cooperation; Educational Change; Elementary Secondary Education; Instructional Improvement; Instructional Innovation; Mathematics Education; Problem Solving; *Program Implementation; Prosocial Behavior; *Small Group Instruction; Social Integration; *Student Role; Student Teacher Relationship; *Teacher Role; *Teaching Methods; Teaching Styles

ABSTRACT

In contrast to the recent back-to-basics movement, which emphasizes rote-learning and the acquisition of mechanistic skills, small-group cooperative learning emphasizes the development of thinking and problem-solving skills. It also seeks to minimize student anxiety and competition by creating an environment in which students feel safe to make and learn from mistakes. Research on cooperative learning suggests that the approach has proven effective in achieving both social and academic goals. As is clear from teachers' experiences with a technique in which students work together in "groups of four" randomly selected every two weeks, the approach requires a different role for teachers and students. Teachers must give up their dominant role in relation to their pupils' thinking, and students must learn to accept more responsibility for themselves and their peers. The approach also involves spatial reorganization, a heightened noise level, and ongoing student evaluation. Although experienced teachers who have used cooperative learning agree as to its advantages, successful implementation requires long-term commitment, support, and understanding from principals and colleagues. Two appendixes describe the most widely used cooperative learning models and discuss such models under two major headings: peer tutoring methods and group investigation methods. (JBM)

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Small-Group Cooperative Learning in the Classroom

Ruth Parker

EA 016 587

March 1984
Vol. 27, No. 7

OSSC BULLETIN

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ISSN 0095-6694

Individual Copy $4.00

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Preface

Small-group cooperative learning carries impressive credentials. When students in the classroom work together in small groups, their learning improves, their problem-solving ability increases, they learn social skills, and they gain a more favorable view of schooling. These well-documented benefits of small-group learning should cause educators to reexamine their assumptions of how the classroom should be organized for learning.

We are indebted to Ruth Parker for this well-written and practical introduction to small-groups cooperative learning. Parker, a former classroom teacher who has been involved with staff dvelopment in Oregon and Washington for the past ten years, is a Graduate Teaching Fellow at the University of Oregon where she teaches primary math methods courses. She is also a K-9 mathematics consultant for Learning Institute and is on the math staff of Marilyn Burns Educational Associates.

Philip K. Piele
Executive Secretary

Introduction

Cooperative learning is a classroom environment where students interact with one another in small heterogeneous groups while working together on academic tasks. An impressive body of current educational research has focused on small-group cooperative learning. Results of the research suggest that having students work cooperatively toward common goals in small heterogeneous groups leads to significant gains on measures of academic achievement, as well as on measures of social relationships, self-esteem, cross-cultural/cross-racial relationships, and attitudes toward school and learning.

Why is there a need for cooperative learning? What does it look like when implemented in the classroom? How does it alter the teacher's role in the classroom? What about the student's role? What classroom organizational changes are necessary? What do teachers who have used cooperative learning say about it? How do we implement cooperative learning in schools? These are the questions that will be explored in this Bulletin. The context for much of this discussion will be mathematics education, though most of the research on cooperative learning has focused on other areas of the curriculum. It is a process appropriate to all areas of the curriculum.

The Need for Cooperative Learning in Schools

> The principal goal of education is to create people who are capable of doing NEW things, not simply of repeating what other generations have done. People who are creative, inventive, and discoverers, who have minds which can be critical, can verify, and not accept everything they are offered. (Piaget, cited by Baratta-Lorton)

Much of education has been focused on the rote learning of narrowly defined skills, with little or no emphasis on the transfer of those skills to problem solving or real life situations. The back-to-basics movement has reinforced that focus. Instruction is increasingly broken down into isolated parts with emphasis given to mastery of the parts. When the student has "mastered" all of the parts, it is often assumed that he or she then has some concept of the whole. But that is not necessarily true.

The National Assessment of Educational Progress (NAEP), a national assessment given every 5 years to 70,000 9-, 13-, and 17-year-olds, illustrates the breakdown. According to the 1983 NAEP results, students have shown a slight increase in rote-level computation skills but a steady decline in problem-solving skills over the past ten-year period. Children are able to add, subtract, multiply, and divide, but are not able to use those skills to solve even simple world problems. Stephen Willoughby, professor of mathematics at New York University and current president of the National Council of Teachers of Mathematics, addressed this concern in saying, "The back-to-basics movement, having misidentified what is really basic, is producing youngsters who are slightly better at skills that were of questionable value in the 19th century and will be of little value in the 21st century" (Willoughby 1983).

As educators, we should question seriously an educational system that has children spending the bulk of their (math) time learning the arithmetic calculations and practicing them with paper and pencil drill. Such practices are not adequately preparing students to function successfully in our technological society. In order to be a successful and contributing member in our modern technological society, students will need skills in problem solving, in being able to tell the computer or calculator the functions to perform to solve a particular problem.

Preoccupation with the rote learning of narrowly focused skills is a concern expressed by other leading educators. Shirley Hill, past president of the National Council of Supervisors of Mathematics, addressed the issue:

> It struck me as supremely ironic that at the very time we are on the threshold of teaching machines to "reason" we are spending an inordinate amount of our educational energies teaching our children mechanistic skills.

The ways we choose to spend our teaching/learning time conveys implicit messages to our students about what is valued and important. If we delegate large amounts of time to the learning of isolated skills, the underlying assumption conveyed is that "learning means mastering specific skills with an emphasis on product." Is that what we want to convey?

Besides this product orientation and lack of problem solving, two other problems have been identified that inhibit children's development, especially in the area of mathematics: competition and anxiety. In addition to spending too much time on learning isolated rote skills, schools are essentially competitive institutions, with students becoming

more competitive as they progress through the system. This competitive model conveys another message: "Quick, right answers are what's valued. It doesn't matter how you get there, just finish quickly and make sure it's right."

Mathematics is one of the most competitively structured subjects in the curriculum. Within this competitive structure the quick, right answer all too often is what's valued. Children learn to depend on the faster thinkers to provide answers and on the teacher for validation of their thinking. Focusing on completing assignments quickly, children rarely stop to question the reasonableness of their answers. Current pedagogical practices inhibit children from becoming self-reliant in their thinking processes (Burns 1983).

The competitive structure and the abstract manner in which mathematics is taught contribute significantly to anxiety concerning mathematics. "Math anxiety" is a well-documented ailment, occurring with widespread frequency in our culture. Research suggests that high levels of anxiety significantly inhibit achievement. Barbara Bulmahn and David Young, in research on math attitudes among elementary education majors, suggest that math anxiety is "a contagious disease, being transmitted by classroom teachers to generations of young people." Math-anxious students who take only the minimum math courses required of them are finding their career options severely limited.

Small-group cooperative learning attempts to deal with all these concerns by maximizing interaction. Students are encouraged to explore ideas, justify their viewpoints, share discoveries, talk through problems, and synthesize knowledge within a safe, supportive

environment.

The contrast between the traditional and the cooperative learning approaches is readily apparent to the observer. In the traditional classroom we see students working on math quietly at their desks. Occasionally a student raises his or her hand for help from the teacher, but other talking is most often discouraged. Since students are competing for the best grades, not only are they reluctant to share ideas, but they are often concerned with shielding their answers from the eyes of other students. In contrast, in the cooperative learning situation, the teacher has assigned the task, and students are working together in small groups, exchanging ideas and pooling knowledge and skills in order to solve problems. In this setting learning is, in essence, a cooperative rather than a competitive endeavor.

Teaching young people to THINK is an educational goal expressed by George Polya, professor emeritus of mathematics at Stanford University:

> Let me be specific. I am concerned here with mathematics in the high school curriculum and I have an old fashioned idea about its aim: first and foremost, it should teach those young people to THINK.

Although few educators would disagree with Polya, a considerable body of research suggests that teaching young people to think is a goal educators are failing to achieve. Small-group learning, with pupils cooperating in the study of academic subject matter, can lead to superior achievement in higher-order thinking. This gain in higher cognitive-level skills is not at the expense of information loss (see Hertz-Lazarowtiz and others 1980, Johnson and others 1979).

Many educators feel that microcomputers offer a solution for developing problem-solving skills, reducing anxiety and competition, and

enhancing thinking skills. What is occurring in classrooms, however, is that microcomputers typically are being used to cover content areas in shorter periods of time, to increase the rote learning of basic facts, to provide individualized instruction, and to teach subject matter in a linear, step-by-step process. Although microcomputers have a tremendous capacity to help develop thinking skills, they are largely being used in schools as simply another method for carrying on current pedagogical practices.

In addition to academic issues, there are social issues of concern to educators. Small-group cooperative learning has been shown to enhance both social relationships and cross-cultural/cross-racial relationships. Students will learn to work together if they have an opportunity to practice such a skill. How do we learn to negotiate, communicate, and make perception checks with each other if we aren't encouraged and expected to engage in these very important life skills? We learn to work together cooperatively by working together cooperatively. It has been shown that such cooperative behavior transfers to situations other than those typical of classroom study (Hertz-Lazarowtiz and others 1980). Mary Robinson, associate professor, Elementary Education Department, Mansfield State College, addresses this concern when she says with regard to cooperative learning:

> Perhaps more important (than achievement gains) in the long run is that we will have taught an attitude of cooperation--pulling together, helping others, sharing problems and unashamedly asking for help, all necessary values for today's world citizen.

In developing cooperative learning structures, one looks for ways not only to address the above mentioned concerns, but also to create a

learning environment in which it is safe to make mistakes and learn from those mistakes; an environment that maximizes social interaction (identified by Piaget as necessary for cognitive development); and an environment in which learning is exciting, pleasurable, and, in the words of Henry Olds, Jr., "not a matter of adapting one's thinking to the thinking of someone in control, but more a matter of contributing to a shared understanding of something and finding ways to share that understanding."

What Does the Research Say about Cooperative Learning?

Research has been done on the effects of cooperative learning on a host of variables including academic achievement, social skills, self-esteem, and cross-cultural/cross-racial relationships. Although research results are strikingly similar regarding the effects of small-group cooperative learning, there are considerable differences between researchers' definitions of cooperative learning. For a detailed description of the most widely used cooperative learning models, see Appendix A. Sharan has identified two major categories of methods for using small-group cooperative learning in the classroom: peer tutoring methods and group investigation methods. These differences are detailed in Appendix B.

Slavin (1981), Sharan (1980), and Johnson and Johnson (1974) all have written reviews of current research on small-group cooperative learning. Although their personal approaches to cooperative learning differ considerably, their conclusions are strikingly similar with regard to the following:

- The overall effects of small-group learning on several variables, including student achievement, have been quite positive. The most significant achievement gain scores were made by high achieving students and low achieving students.
- Consistently favorable achievement results have been made by minority students in cooperative classes.
- Equally consistent positive effects of cooperative learning

programs have been found on such outcomes as self-esteem, social relations, attitudes toward mainstreamed students, and race relations.

- Children's cooperative behavior skills were shown to transfer to interaction with peers who weren't members of the same learning teams, and to their behavior in social situations not structured by the teacher.

In a synthesis of research on cooperative learning (1981), Robert Slavin suggests that not only have principles of cooperative learning methods been effective on a wide range of outcomes, they have proven to be practical and widely acceptable to teachers. He suggests that one major reason for this might be that research has "clearly shown that changing from a traditional competitive classroom to a cooperative one does not diminish student achievement; often it significantly improves achievement." He further suggests that cooperative learning methods can be used by teachers to achieve social and academic goals at the same time, without sacrificing one for the other.

The Johnsons (1978) report that when student-student interaction is cooperative in most classrooms, the school environment will also reflect the positive outcomes of the classrooms. Teachers will also tend to be more cooperative in their staff interactions.

Cooperative Learning in Practice

Marilyn Burns describes a group investigation model called Groups of Four in the September 1981 issue of Learning magazine. Groups of Four is a cooperative learning technique suitable to all grade levels and a variety of curriculum areas. Let's take a look at the process being implemented in a classroom...

When we enter Ms. Buck's classroom, we see students seated in groups of four around small rectangular tables. (Until Ms. Buck was able to convince her principal of the value of group work and of her need for small tables rather than desks, she grouped students by having them push four desks together). On each table is a label, "Ace", "2", "3", etc. (Every other Monday morning when students enter the classroom they draw a card from a deck of cards lying on the table beside the door. They get their suplies from their trays and go to the table labeled with their card number). It is math time when we enter and each group is working on a problem-solving task. We watch as students within each group share ideas and questions, occasionally working individually, but pooling their findings onto a large group recording sheet.

While students are working, Ms. Buck circulates--watching the interactions--and occasionally stops to interact with a group, usually asking a probing question to get the group to explore an idea more thoroughly. We are struck by the fact that students don't seem to be asking Ms. Buck for help, yet the interaction they do engage in with her seems of a very positive nature. After observing for 10 to 15 minutes, suddenly all hands in one group go up in unison with great eagerness, at which time Ms. Buck approaches the group. This seems curious until we notice a sign posted on the classroom wall that says:

GROUPS OF FOUR RULES

1. Each member of the group is responsible for his or her behavior.

2. Each member of the group must be willing to help any other group member who asks for help.

3. You may only ask the teacher for help if all four group members have the same question.

As we wander through the classroom we hear students within the groups interacting while exploring ideas, justifying their viewpoints, sharing discoveries, talking through problems, synthesizing knowledge--helping each other and asking for help. We listen in as one group decides that their required task is completed. All four hands in the group go up, and Ms. Buck approaches the group. She looks at their group work, asks a few probing questions, then gives the group a "challenge" problem. As soon as the group is working on its challenge, Ms. Buck explains to us that when the class does a specific "Groups of Four" task she always has challenge extensions ready for groups that finish the tasks before everyone is ready to discuss the process.

There are two parts to the followup discussion. The first part focuses on the academic task at hand. The second part focuses on the interactions within the groups. Both parts are seen as critical to the whole cooperative learning model. Ms. Buck is obviously developing cooperative social skills in addition to developing math skills. One group mentions that they did not work well together. Ms. Buck asks the group what they thought was the problem. Two students felt that another student was running the whole show and not letting them have any input. A class discussion ensued on qualities of good leadership. Ms. Buck notes that, since the group will be working together for two weeks (and at times be evaluated on their group products and group interactions), it is important for the four students to work through their initial difficulty.

Approximately 90 minutes have passed since we entered the classroom. Ms. Buck asks students to work on their stories. We stay and observe as students work individually on the stories they're writing for Language Arts. They are still seated four to a table, and we are impressed that although they are working individually on projects, they interact with each other when they need help or want feedback on an idea. It seems apparent that cooperative learning has become more a "culture" in the clasroom than just a specific model for small-group learning.

Small-group cooperative learning as described in the scene above involves significant changes in the role of the classroom teacher. Successful implementation of the innovation requires deep conceptual understanding on the part of both teacher and student. We can use the example of Ms. Buck's class to explore some of the reasons why.

A Different Role for the Teacher

New cognitions are required on the part of the teacher. In more traditional classroom goal structures, teachers are the imparters of knowledge, maintainers of classroomm control, validaters of thinking. In short, they control the learning that goes on in the classroom--knowing the end product of the learning experience as well as the sequence of activities and procedures to achieve the learning goal. Traditional goal structures for the most part tend to be teacher centered.

With cooperative activities, on the other hand, teachers specify the instructional objectives, arrange the classroom to maximize social interaction, provide the appropriate materials, explain the task and the cooperative goal structure, observe the student-student interactions, help students problem-solve both the learning process and social relationships within the groups, and evaluate the group products.

In short, teachers have the important, but often difficult, task of encouraging students to become responsible for their own learning and to rely more heavily upon their classmates for assistance in doing a task and evaluating an answer. The teacher helps the students gain confidence in their own ability and the group's ability to work out problems and thus rely less upon the teacher as the only source of knowledge. The assumption is made that pupils will be highly motivated by the social contact with peers and by the sense of achievement gained as they obtain success on challenging tasks through the group effort rather than through teacher direction (Robinson 1979).

Instructional materials needed for cooperative learning activities

are dependent on the activity and the subject matter. Materials will vary from the textbook to a variety of materials where students can gather information, explore ideas, and test theories. Perhaps the most significant difference in materials required is the need to extend learning beyond the textbook. Working cooperatively in problem-solving situations, students will have questions and ideas not covered by the text. The teacher's role, then, is to provide the means for students to pursue their ideas through a variety of resources. Along with the move beyond the textbook (and hence the answer book), the teacher must become comfortable saying, "I don't know, yet!", for learning will take directions that she or he wouldn't have imagined ahead of time. The teacher, therefore, is able to continue being a learner--stretched by the students--a situation, regretfully, all too rare in today's classroom.

For many teachers, giving up their dominant role in relation to their pupils' thinking is uncomfortable and in many instances impossible without deep conceptual understanding of the process and outcomes of such a goal structure. This understanding is critical if cooperative learning environments are to be implemented. Teachers have to understand and actively seek to implement such environments, for researchers are in agreement that cooperative environments will not happen naturally in the classroom.

What about the Student's Role?

Cooperative learning not only involves major shifts for teachers, but also involves major changes in the role of the student. For the most part, students have learned that the teacher is there to validate

their thinking and to direct their learning. They learn early that they are constantly compared with one another for grades and recognition. As children work inividually within the competitive structure, Slavin suggests that the "classroom winners and losers can be predicted fairly reliably the day they first come into class: those who have succeeded in the past will probably succeed, and those who have failed will probably fail" (Slavin 1981).

Along with encouraging students to work together and share ideas, the teacher needs to help children learn how to "help" their classmates. A student needs to understand that "telling an answer" or "writing on someone's paper" is not helping. Helping involves learning to ask questions that enable the learner to grasp meaning, or explaining a small part of the problem for a related problem. Such understanding needs to be actively and explicitly developed by the teacher. It requires significant changes in attitudes for students to learn to work cooperatively, to share ideas rather than compete for recognition, and to evaluate the outcomes of their learning. Such changes will not occur unless there is real commitment on the part of the teacher to develop those cooperative skills. Such major changes in cognitions require adequate time to develop.

Looking at Ms. Buck's class, we saw that students were randomly assigned to groups of four every two weeks. The random assignment is an attempt to maximize the heterogeneity in the group. The complete randomness of the chance draw of the cards means that students don't have the option of choosing whom to work with. The teacher's goal is that by the end of the year students will <u>all</u> be able to work

cooperatively with each other, and this goal needs to be made explicit. Along with that, students need to know that the teacher is committed to helping them work together, though it won't always be easy.

In Ms. Buck's class, students were working cooperatively in the subject area of math. It should be made clear, however, that small-group cooperative learning is a process equally appropriate to other content areas. Small groups of students can write collective stories, edit each other's writing, prepare each other for social studies tests, correct their individual homework assignments by comparing answers, and as a group work through any problems where answers differ and turn in one sheet with all group members' names on it. This last technique not only reduces the papers the teacher has to check from 32 to 8, but more importantly, it keeps the focus on the learning by having students validate their own answers. In short, cooperative learning does become more a "culture" or attitude that pervades the classroom rather than a specific technique. Developing that culture, however, requires specific skills while students (and teachers) are learning to work cooperatively.

Classroom Organizational Changes

In terms of organizational changes required by the innovation, there are several significant changes necessary. Perhaps the most obvious is that cooperative learning will not take place with students sitting in rows facing the teacher in the front of the room. Either desks need to be pushed together in small groups or they need to be replaced by small tables to facilitate social interaction. Students also need to have ready access to resource materials. If students need

to raise their hands for permission to get out of their seats to use those resources, the kinds of learning being described here will not be enhanced. This implies that responsible behavior needs to be developed and encouraged. An authoritarian approach to discipline will not work if we are expecting students to be responsible for their own behavior and indeed for their own learning.

Another change that fits the category of organizational change is the noise level in the room. Students working together sharing ideas, even in a controlled manner, will be louder than students working individually and silently from a text. Teachers need to be able to evaluate whether or not the noise is constructive noise. But, in the words of Mary Baratta-Lorton, "It is silence we as teachers have to justify, not talking."

Evaluation of the innovation necessitates a combination of objective and subjective evaluation procedures. Learning outcomes will continue to be measured by a variety of objective measures, such as standardized tests, unit exams, quizzes, and worksheets. In addition to the more objective measures of learning outcomes, cooperative learning requires subjective measures. Both students and teachers need to be involved in evaluating the climate for the classroom in terms of discipline, social relationships, self-esteem of the students, as well as the academic outcomes of "learning together."

Experiences of Teachers Who Have Used Cooperative Learning

Not only does research support cooperative learning, but teachers also support this model. Carol Meyer is a fifth- and sixth-grade teacher in Davis, California, who has been using small-group cooperative learning in her classroom for a number of years. She separates the benefits of cooperative learning into two (sometimes overlapping) categories: benefits for students and benefits for the teacher. In terms of student advantages, Carol believes that the children are provided with a support group. The small groups provide safe opportunities for trial and error as well as a safe environment in which to ask questions or express opinions. She gets more student response as many students, who would not ask a question in front of 30 classmates, ask questions and suggest ideas in a group of 4. As each student brings unique strengths and contributions to the group process, Carol feels that small-group learning promotes respect for individual differences.

Another advantage noted by Carol is that the group acts as a motivator. There are many times that an individual student would have felt the task was complete until hearing a idea from another group member. Having more input and more ideas helps the learning "snowball." The quality and quantity of the thinking of the group far surpasses what the individual can accomplish alone. It's the group interaction that enhances the triggering of new ideas. While expressing her goal that, by the end of the year, all children in the class will be able to work cooperatively with each other, Carol uses a random procedure (a draw of the cards) to group the children. She feels that this randomness

reduces labeling in the classroom. Not only do children get to hear and have more ways to problem solve within a small-group structure, but each child also has many opportunities to be both a teacher and a student.

As teacher advantages, Carol suggests that with small-group learning she now has 8 groups rather than 32 students to make good contact with each day. In addition she has 32 aides in the classroom! Carol gets help with discipline (maintaining a cooperative atmosphere), as students have learned a "spirit" of helpfulness and cooperation. She also feels that her children are better listeners within a cooperative structure. When four children have tried to solve a problem together and finally raise their hands for her help, they are ready to hear her input. She suggests that she also gets good questions, as her students have learned that they can solve most of their questions within their groups. Perhaps most importantly, Carol says that the use of small-group cooperative learning in the classroom provides her with the opportunity to continue to be a learner. Her students are continually taking learning in directions she would never have imagined.

Ann Woeste, a fourth-grade teacher at Edison Elementary in Eugene, Oregon, began using small-group cooperative learning (Groups of Four) in her classroom this fall. Although she began using Groups of Four in her math classes, she finds the process easily adaptable to other curriculum areas, particularly social studies. Ann feels that the small-group structure extends children's resources, in that they are encouraged to share ideas and pool strategies. She cautions that it would be easy to try small-group cooperative learning in the clasroom one or two times and decide it doesn't work. Not only is the process new to the teacher,

but she found that the children, initially, didn't really believe it when she told them they were to cooperate on their work. She found that by grade 4 they already had strong ideas about "ownership" of ideas.

She suggests that the more you try small-group learning the easier it gets for both the students and the teacher. Ann feels that the group structure enables things to run more effectively and efficiently in her classroom. She finds it easier to make contact with her seven groups than with each individual student. Ann keeps desks permanently pushed together in groups of four, but changes groups approximately every two weeks. She says that this organizational structure has been helpful because whenever work is collected or supplies distributed each group selects one person to do the leg work for the group. Movement is reduced from 27 children to 7.

Cindy Ruptic, a fifth-grade teacher at John Tuck School in Redmond, Oregon, has also used Groups of Four in her classroom. According to Cindy:

> I have a group of students this year who really have a hard time staying "at task" when given choices within a long time framework (1 hour). Groups of Four has helped these students learn to monitor their time at task. It is neither I nor themselves who point out their off task behaviors, but a group of their peers. This seems to be a good "halfway" spot for these kids...not immediately under the thumb of an adult and yet not completely left to their own design. They are learning from their peers not only <u>how</u> to be at task, but also that working hard is something that is valued and respected by the group.

Cindy has used other groupings in her classroom, but finds that the randomness of the Groups of Four process has the advantage of freeing her students from stereotyping others in the class. "They like the 'magic' of the draw from the deck of cards or the pattern blocks.

Choosing the group is, in itself, a game for them. It's nonpersonal--I didn't make the group, they weren't not chosen--it's all in the draw."

Lewis Oatman, an elementary teacher in Madras, Oregon, suggests that when he first started using Groups of Four in the classroom (as part of an assignment for a course he was taking), he had some reservations and fears that it wouldn't work. Many of these fears, he says, have proven unfounded. One of Lewis' concerns was that his slower students would be left out and would not contribute to the group effort. In his words:

> The opposite, in fact, was true. Groups of Four develops a strong sense of unity within the group. I found that the slower and unsure student could and did become active in the group. They were included and their opinions were shared with other members of the group. In fact, I noticed that this unity carried over into other areas and even onto the playground. I saw a big change in the entire class and their feeling toward each other. There were less "put-downs" and the members of the class started listening to others. All students were able to express their feeling and their opinions.

Lewis also addresses the issue of noise in the classroom.

> The noise level bothered me at first. I had to accept the idea that there is noise and there is constructive noise which leads to learning. After twenty years in the classroom, it is very hard to change. When one is used to having the students in nice, neat rows, each working individually, change is hard to accept. Groups of Four allows the students to share ideas and to cooperatively solve a problem. I have noticed that what I thought was noise is actually learning taking place and ideas flowing from one to another. I don't have to spend my time being a policeman. I can move about freely, working with small groups and watching learning take place.

Lewis has also used groups to correct homework papers. He says, "I have found that I have less paperwork now. I have 5 papers to look at instead of 18. Therefore, my energy can be used in other ways. I still evaluate the learning. My students are learning that they are capable

of validating their ideas, and they are still achieving the desired goals established for them." Lewis stresses that small-group learning is not without its problems:

> Problems still come up and things don't go as planned. At least the groundwork has been laid to discuss and evaluate why certain things happened and what could be done to change. Groups of Four offers an opportunity for problem solving and for developing thinking, even if it is to say, "Hey, what happened? What caused the break down?"

Reluctance to try a new classroom structure, a common sentiment expressed by teachers, was described by Sharon Baird, an elementary teacher in Roseburg, Oregon. In a course paper she wrote after taking a course on mathematics and small-group cooperative learning, Sharon said, "I didn't want to take the class, and left several sessions less than happy....BUT somewhere along the way I got hooked....not by the instructor or the subject or even me. I got hooked because as I tried the ideas, they worked for the kids--all the kids, and in ways I never would have thought to challenge them."

Sharon comments that her high-achieving students sometimes had the most difficulty working within a group. These students are often used to being rewarded for the quick, right answers, and it often takes time before they are comfortable working cooperatively. Yet research suggests that high-achieving students make significant achievement gains within a small-group structure. Explaining a process to group members is most likely beneficial for these students who often rush through the process without "thinking."

Implementation of Cooperative Learning

Slavin, the Johnsons, and Sharan, in their reviews of current research, were in consensus that cooperative learning will not appear magically. Unless teachers make a conscientious effort to develop cooperative skills among students, and unless administrators offer support and encouragement of such efforts, schools are likely to remain essentially competitive learning environments. In light of the many benefits, both academic and social, of small-group cooperative learning, it's time educators take a serious look at implementing cooperative learning in schools at all grade levels.

Techniques for training teachers and students in group cooperation are not difficult. Small-group cooperative learning is a model this author has used extensively in elementary, middle school, and high school classrooms, and also in math methods courses at both the preservice and inservice levels. Although teachers express enthusiasm for cooperative learning, there are important factors that must be considered if schools are to effectively implement cooperative learning in classrooms. Current research on school improvement and change suggests a number of principles that must be considered if an innovation is to be successfully implemented in a school. These principles include:

1. Change in educational practices takes considerable time and is the result of systematic, long-range staff development (Joyce and others 1983).
2. Change is most likely to occur if inservice is directed at

the teaching staff of a school rather than appealing to teachers as individuals.

3. Teachers need support while implementing new skills until they become a comfortable part of the teachers' repertoire (Showers and Joyce 1982).
4. Teachers need to be actively involved in learning new techniques and goal structures. Long-term change in behavior is more likely to occur if teachers have the opportunity to internalize the benefits of the desired goal structure.

The typical inservice workshop, usually lasting one day, effects minimal, if any change in the classroom (Gall and Haisley 1982). One-day inservice programs do not provide adequate time for a training cycle that forecasts the transfer process. Small-group cooperative learning is a process that is new to both the teacher and the students. It takes time and practice for new skills to become a comfortable part of one's teaching repertoire. Teachers most often leave inservice workshops excited to try new ideas in their classrooms. All too often, however, they try the new idea, it doesn't work well the first time, and they conclude that "it just doesn't work for my kids." Inservice should be provided over a period of time that allows teachers to try several small-group activities within their classrooms, share experiences and ideas, and receive feedback within the supportive environment of the inservice setting.

It is important that teachers have onsite support while they are implementing small-group cooperative learning. Such support can be

provided by collegial teaching groups or by frequent, continuous, and increasingly concrete talk about cooperative learning on the part of the entire staff. Fullan (1982) suggests that innovations are more likely to be successful in schools that come to have a schoolwide emphasis and expectation that they can improve student learning. Doran (1980) suggests that, despite the fact teachers need help in applying the new knowledge they have gained during inservice, they are most often left to work in isolation from other adults. It is important that administrators provide ongoing support while teachers are implementing small-group cooperative learning in their classrooms. Professional growth requires personal and group commitment to new performance norms (Wood and others 1981).

During inservice, teachers should have the opportunity to experience first-hand the benefits of small-group cooperative learning. They should experience a variety of activities within a cooperative setting that are designed to be directly transferrable to the classroom both in content and process. The training should offer a safe arena for teachers to experience, understand, and try out new techniques (Sharan 1980).

However well teachers are prepared, they potentially will still have discomfort or even disasters while initially implementing cooperative learning in the classroom. Fullan (1982) suggests that all real change involves loss, anxiety, and struggle. During this time of discomfort, it is important that teachers have the backing and active support of administrators. Principals should be knowledgeable about the benefits of cooperative learning. Fullan suggests that principals

should arrange frequent meetings with small groups of teachers and department heads to exchange ideas and information. According to Wood and others (1981), "The school principal is the gatekeeper for adoption and continued use of new practices and programs in a school."

Without attention to these components affecting the change process in schools, chances for long-term successful implementation of cooperative learning will be minimal. If these variables are addressed, however, and if the innovation is successfully implemented, we can expect to see not only achievement gains as promised by the research, but also a change in the learning environment. The classroom will become an environment where it will be safe to make mistakes and learn from those mistakes--an environment that encourages social interaction, creativity, inventiveness, discovery, and critical thinking and that, indeed, provides opportunities for students to do NEW things, not just repeat what other generations have done.

Appendix A

Slavin has described the most widely used cooperative learning models:

- Student Teams-Achievement Divisions (STAD)--Students assemble in teams of four or five members to master worksheets on material covered in a lesson just presented by the teacher. Subsequently, they individually take a quiz on that material. The team's overall score is determined by the extent to which each student improved over his or her past performance. The team demonstrating the greatest improvement is recognized in a weekly class newsletter.

- Teams-Games-Tournament (TGT)--The procedure in TGT is the same as that used in STAD, but instead of taking quizzes, the students play academic games with other members in the class whose past performance was similar to their own. The team score is also based on individual improvement.

- Jigsaw --Students meet in five- or six-member teams. The teacher gives each student an item of information which the student must "teach" to the team. Students are then individually tested for their mastery of the material. Jigsaw II is the same, except that students obtain their information from textbooks, narrative material, short stories, or biographies. The class is then quizzed for individual and team scores.

- Learning Together --After the teacher has presented a lesson, students work together in small groups on a single worksheet. The team as a whole receives praise and recognition for mastering the worksheet.

- Group-Investigation --This is a more complex method, requiring students to accept greater responsibility for deciding what they will learn, how they will organize themselves to master the material, and how they will communicate what they have learned to their classmates (Slavin 1981: 659).

Appendix B

Two major headings used by Sharan to describe the various small-group learning models are: (1) peer tutoring methods, which include Aronson's Jugsaw method and Slavin's Team-Games-Tournaments and Student-Team-Achievement-Divisions; and (2) group investigation methods as employed by Sharan, the Johnsons, and Robinson. Sharan describes the major differences between the two models as follows:

TABLE 1

Critical Differences between Peer-tutoring and Group-investigation Methods of Cooperative Learning in Teams

Peer-tutoring	Group-investigation
Source and Variety of Information and the Nature of the Learning Task	
(1) Information is transmitted by the teacher or a text	(1) Information is gathered by the pupils
(2) Learning sources are limited to cards, a worksheet or lecture	(2) Learning sources are varied in number and kind
(3) Tasks emphasize information and/or skill acquisition	(3) Tasks stress problem solving, interpretation, synthesis, and application of information
Interpersonal Relations and Communication	
(4) Peer communication in teams is primarily unilateral or bilateral (dyadic)	(4) Communication in teams is primarily bilateral and multilateral (discussion)
(5) Peer communication is for rehearsal of teacher-taught materials	(5) Peer communication is for interpretation and exchange of ideas
(6) Peer interactions frequently imply status distinctions ("I teach, you listen.")	(6) Interactions are primarily based on mutual exchange
(7) Pupils interact sporadically or in dyads	(7) Group members coordinate activities on a group-wide basis
Academic Product, Evaluation and Rewards	
(8) Academic product is independent (i.e. there is cooperation in means but not in goals)	(8) Academic product is interdependent (i.e. there is cooperation in means and in goals)
(9) Evaluation is primarily individual (individual tests, scores)	(9) Evaluation is both individual and group (group report or project as collective product)
(10) Rewards are extrinsic (reinforcement in the form of personal praise)	(10) Rewards are primarily intrinsic (self-directed interest in topic)
Classroom Organization	
(11) The class functions as an aggregate of teams which are uncoordinated or engaged in a uniform task	(11) The class functions as a "group-of-groups" with between-group coordination and division of labor and tasks

(Sharan 1980: 264)

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